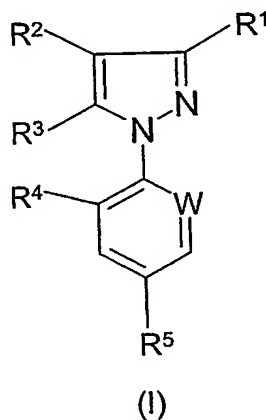


Claims

1. Use of a compound of formula (I) or an agriculturally acceptable salt thereof for plant growth regulation



wherein:

R^1 is CONR^6R^7 or CO_2R^8 ;

W is C-halogen or N;

R^2 is H or $\text{S(O)}_m\text{R}^9$;

R^3 is $\text{NR}^{10}\text{R}^{11}$, halogen, OH, $(\text{C}_1\text{-C}_6)$ -alkoxy, $(\text{C}_2\text{-C}_6)$ -alkenyloxy or $(\text{C}_2\text{-C}_6)$ -alkynyloxy;

R^4 is H, or halogen;

R^5 is $(\text{C}_1\text{-C}_4)$ -haloalkyl or $(\text{C}_1\text{-C}_4)$ -haloalkoxy;

R^6 is H, $(\text{C}_1\text{-C}_6)$ -alkyl, $(\text{C}_1\text{-C}_6)$ -haloalkyl, $(\text{C}_1\text{-C}_6)$ -alkoxy- $(\text{C}_1\text{-C}_6)$ -alkyl, $(\text{C}_2\text{-C}_6)$ -alkenyl, $(\text{C}_2\text{-C}_6)$ -haloalkenyl, $(\text{C}_2\text{-C}_6)$ -alkynyl, $(\text{C}_2\text{-C}_6)$ -haloalkynyl, $(\text{C}_3\text{-C}_7)$ -cycloalkyl, $(\text{C}_3\text{-C}_7)$ -cycloalkyl- $(\text{C}_1\text{-C}_6)$ -alkyl, $(\text{C}_1\text{-C}_6)$ -alkoxy, $(\text{C}_1\text{-C}_6)$ -alkylthio, $(\text{CH}_2)_n\text{R}^{12}$, $(\text{CH}_2)_p\text{R}^{13}$, $(\text{C}_1\text{-C}_6)$ -alkyl-CN, $(\text{C}_1\text{-C}_6)$ -alkyl- $\text{NR}^{10}\text{R}^{11}$ or $(\text{C}_1\text{-C}_6)$ -alkyl- $\text{S(O)}_r\text{R}^9$;

R^7 is H, $(\text{C}_1\text{-C}_6)$ -alkyl, $(\text{C}_3\text{-C}_6)$ -alkenyl or $(\text{C}_3\text{-C}_6)$ -alkynyl; or

R^6 and R^7 together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, $(\text{C}_1\text{-C}_6)$ -alkyl and $(\text{C}_1\text{-C}_6)$ -haloalkyl;

R^8 is H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl or (CH₂)_nR¹²;

R^9 is (C₁-C₆)-alkyl or (C₁-C₆)-haloalkyl;

R^{10} and R^{11} are each independently H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₆)-alkyl, COR¹⁴ or CO₂R¹⁵; or

R^{10} and R^{11} together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl and (C₁-C₆)-haloalkyl;

R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₁-C₆)-alkoxy, (C₁-C₆)-haloalkoxy, CO₂R¹⁶, CN, NO₂, S(O)_qR⁹, COR¹⁶, CONR¹⁶R¹⁷, NR¹⁶R¹⁷ and OH;

R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-haloalkyl, (C₁-C₄)-alkoxy, (C₁-C₄)-haloalkoxy, NO₂, CN, CO₂R¹⁶, S(O)_qR⁹, OH and oxo;

R^{14} and R^{15} are each independently H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl or (C₁-C₆)-alkoxy-(C₁-C₄)-alkyl;

R^{16} and R^{17} are each independently H, (C₁-C₆)-alkyl or (C₁-C₆)-haloalkyl;

m, q and r are each independently 0, 1 or 2;

n and p are each independently 0, 1, 2, 3 or 4; and

each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 7 ring atoms and 1, 2 or 3 heteroatoms in the ring selected from the group consisting of N, O and S.

2. The use of a compound as defined in claim 1, in which in which

R^1 is CONR⁶R⁷;

W is C-Cl or C-Br

R^2 is S(O)_mR⁹;

R^3 is $NR^{10}R^{11}$, halogen, OH, (C_1-C_3) -alkoxy, (C_2-C_6) -alkenyloxy or (C_2-C_6) -alkynyloxy;

R^4 is Cl or Br;

R^5 is CF_3 or OCF_3 ;

5 R^6 is H, (C_1-C_4) -alkyl, (C_1-C_4) -haloalkyl, (C_1-C_3) -alkoxy- (C_1-C_3) -alkyl, (C_3-C_4) -alkenyl, (C_3-C_4) -haloalkenyl, (C_3-C_4) -alkynyl, (C_3-C_4) -haloalkynyl, (C_3-C_6) -cycloalkyl, (C_3-C_6) -cycloalkyl- (C_1-C_3) -alkyl, (C_1-C_3) -alkoxy, (C_1-C_3) -alkylthio, $(CH_2)_nR^{12}$ or $(CH_2)_pR^{13}$;

R^7 is H, (C_1-C_4) -alkyl, (C_3-C_4) -alkenyl or (C_3-C_4) -alkynyl; or

10 preferably R^6 and R^7 together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C_1-C_3) -alkyl and (C_1-C_3) -haloalkyl;

15 R^9 is (C_1-C_3) -alkyl or (C_1-C_3) -haloalkyl (more preferably R^9 is CF_3);

R^{10} and R^{11} are each independently H, (C_1-C_3) -alkyl, (C_1-C_3) -haloalkyl, (C_3-C_4) -alkenyl, (C_3-C_4) -haloalkenyl, (C_3-C_4) -alkynyl, (C_3-C_6) -cycloalkyl, (C_3-C_6) -cycloalkyl- (C_1-C_3) -alkyl, COR^{14} or CO_2R^{15} ; or

20 R^{10} and R^{11} together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N; the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C_1-C_3) -alkyl and (C_1-C_3) -haloalkyl;

25 R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C_1-C_3) -alkyl, (C_1-C_3) -haloalkyl, (C_1-C_3) -alkoxy, (C_1-C_3) -haloalkoxy, CO_2R^{16} , CN, NO_2 , $S(O)_qR^9$, COR^{16} , $CONR^{16}R^{17}$, $NR^{16}R^{17}$ and OH;

30 R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C_1-C_3) -alkyl, (C_1-C_3) -haloalkyl, (C_1-C_3) -alkoxy, (C_1-C_3) -haloalkoxy, NO_2 , CN, CO_2R^{16} , $S(O)_qR^9$, OH and oxo;

R^{14} and R^{15} are each independently H, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₂-C₃)-alkenyl, (C₂-C₃)-haloalkenyl, (C₂-C₃)-alkynyl or (C₁-C₆)-alkoxy-(C₁-C₄)-alkyl;

R^{16} and R^{17} are each independently H, (C₁-C₃)-alkyl or (C₁-C₃)-haloalkyl; and each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 6 ring atoms and 1, 2 or 3 hetero atoms in the ring selected from the group consisting of N, O and S.

3. The use of a compound as defined in claim 1, in which

R^1 is CONR⁶R⁷;

W is C-Cl;

R^2 is H, or S(O)_mR⁹;

R^3 is NR¹⁰R¹¹, halogen, OH or (C₁-C₃)-alkoxy;

R^4 is Cl;

R^5 is CF₃;

R^6 is H, (C₁-C₄)-alkyl, (C₁-C₃)-alkoxy-(C₁-C₂)-alkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₂)-alkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-alkylthio, (CH₂)_nR¹² or (CH₂)_pR¹³;

R^7 is H, (C₁-C₃)-alkyl, (C₃-C₄)-alkenyl or (C₃-C₄)-alkynyl;

R^9 is methyl, ethyl or CF₃;

R^{10} and R^{11} are each independently H, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-haloalkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₃)-alkyl, COR¹⁴ or CO₂R¹⁵; or

R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, CO₂R¹⁶, CN and NO₂;

R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, NO₂, CN, CO₂R¹⁶, S(O)_qR⁹, OH and oxo;

R^{14} and R^{15} are each independently (C₁-C₃)-alkyl;

R^{16} and R^{17} are each independently H or (C₁-C₃)-alkyl; and

each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 6 ring atoms and 1, 2 or 3 hetero atoms in the ring selected from the group consisting of N, O and S.

- 5 4. The use of a compound as defined in claim 1, in which

R^1 is CONR^6R^7 ;

W is C-Cl;

R^2 is H, or $\text{S(O)}_m\text{R}^9$;

R^3 is NHR^{10} ;

10 R^4 is Cl;

R^5 is CF_3 ;

R^6 is H, (C₁-C₅)-alkyl, (C₁-C₂)-alkoxy-(C₁-C₂)-alkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₂)-alkyl, furfuryl or tetrahydrofurfuryl;

15 R^7 is H or (C₁-C₃)-alkyl;

R^9 is methyl, ethyl or CF_3 ; and

R^{10} is H, methyl or ethyl.

- 20 5. The use of a compound as defined in claim 1, in which

R^1 is CO_2R^8 ;

W is C-Cl;

R^2 is H, or $\text{S(O)}_m\text{R}^9$;

R^3 is $\text{NR}^{10}\text{R}^{11}$;

R^4 is Cl;

25 R^5 is CF_3 ;

R^8 is H, methyl or ethyl;

R^9 is methyl, ethyl or CF_3 ;

R^{10} is H, methyl or ethyl; and

R^{11} is H.

30

6. The use of a compound as defined in claim 1, in which

R^1 is CONR^6R^7 ;

W is C-Cl;

R² is S(O)_mCF₃;

R³ is NR¹⁰R¹¹, halogen, OH or (C₁-C₂)-alkyl;

R⁴ is Cl;

5 R⁵ is CF₃;

R⁶ is H or (C₁-C₃)-alkylthio;

R⁷ is H;

R¹⁰ is (C₁-C₃)-alkyl, COR¹⁴ or CO₂R¹⁵;

R¹¹, R¹⁴ and R¹⁵ are each independently (C₁-C₃)-alkyl.

10

7. A composition for plant growth regulation, which comprises one or more compounds of formula (I) as defined in anyone of claims 1 to 6 or an agriculturally acceptable salt thereof, carriers and/or surfactants useful for plant protection formulations.

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8. The composition as claimed in claim 7, which comprises a further active compound selected from the group consisting of acaricides, fungicides, herbicides, insecticides, nematocides or plant growth regulating substances not identical to compounds defined by formula (I) of claim 1.

20

9. The use of a composition as claimed in anyone of claims 7 to 8 for plant growth regulation, in which the plant is a monocotyledoneous or dicotyledoneous crop plant.

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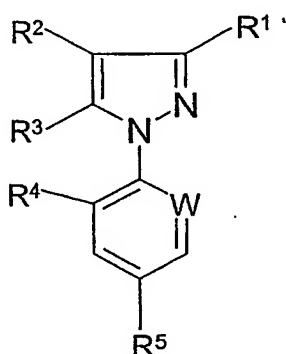
10. The use as claimed in claim 9, wherein the plant is selected from the group consisting of wheat, barley, rye, triticale, rice, maize, sugar beet, cotton, or soybeans.

30

11. A method for growth regulation in field crop plants, which comprises applying an effective amount of a compound of formula (I) as defined in claims 1 to 6 to the site where the action is desired said method comprising applying to plants, to seeds from which they grow or to the locus in which they grow, a non-

phytotoxic, effective plant growth regulating amount of one or more compounds of formula (I).

12. A method as claimed in claim 11 that results into a yield increase of at least 10% concerning the plants to which it is applied.
13. A compound as defined by formula (I), or a salt thereof,



(I)

wherein:

- i. R¹ is CO₂R⁸;
 R² is H or S(O)_mR⁹;
 R³, R⁴, R⁵, W and m are as defined in claim 1;
 R⁸ is H; and
 R⁹ is (C₂-C₆)-alkyl or (C₁-C₆)-haloalkyl;

or

- ii. R¹ is CONR⁶R⁷;
 R⁶ is (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₁-C₆)-alkoxy-(C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl, (C₂-C₆)-haloalkynyl, (C₃-C₇)-cycloalkyl, (C₃-C₇)-cycloalkyl-(C₁-C₆)-alkyl, (C₁-C₆)-alkoxy, (C₁-C₆)-alkylthio, (CH₂)_nR¹², (CH₂)_pR¹³, (C₁-C₆)-alkyl-CN, (C₁-C₆)-alkyl-NR¹⁰R¹¹ or (C₁-C₆)-alkyl-S(O)_rR⁹; or

5 R⁶ and R⁷ together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl and (C₁-C₆)-haloalkyl; and R², R³, R⁴, R⁵, R⁷, R⁹, R¹⁰, R¹¹, R¹², R¹³, W, n, p and r are as defined in formula (I);

with the exclusion of the compound wherein:

R¹ is CON(CH₃)₂; R² is CF₃S; R³ is OH; R⁴ is Cl; R⁵ is CF₃; and W is C-Cl.